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Your petitioner, **LINO E. TORNERO**, a citizen of the United States and a resident of the city of Colfax, State of North Carolina, whose post office address is 809 Quailmeadow Lane, Colfax, North Carolina 27235, prays that Letters Patent may be granted to him for improvements in a **POSITIONING DEVICE FOR FURNITURE** as set forth in the following specification.

POSITIONING DEVICE FOR FURNITURE

FIELD OF THE INVENTION

The invention herein pertains to devices that provide positioning of structural members relative to one another and which are particularly useful in the furniture industry. Uses may include adjustable chair arms and other components to provide ergonomic comfort.

DESCRIPTION OF THE PRIOR ART AND OBJECTIVES OF THE INVENTION

Positioning mechanisms for chair arms, backs, seats and the like have long been known in the industry. U.S. patent Nos. 4,613,106; 4,616,812; 4,720,068: 4,749,230; 4,930,840; 5,338,133; 5,388,892; 5,586,811; 5,660,442 and 5,951,107 demonstrate a few of the known adjustable mechanisms that are commonly used. Certain prior devices utilize external knobs, clamps, and levers that are often difficult or hazardous to operate, and often cause the user to assume uncomfortable positions to adjust them. Today's ergonomic requirements in the market place and furniture industry demand user friendly, easily adjustable mechanisms that permit rapid and safe adjustment. Many prior positioning devices are complex and expensive to manufacture. In some cases, precision and smooth operation is sacrificed in favor of economy, causing such mechanisms to wobble or move in uneven paths during adjustment and operation.

Some make excessive noise, or bind and cease to function altogether. In other cases, such as mechanisms that provide for discrete adjustment positions selectable by the use of levers, the user often struggles trying to find the most desired position.

Thus, with the problems and disadvantages of previous furniture positioning and adjusting devices, the present invention was conceived, and one of its objectives is to provide a precise and substantially wobble-free positioning device that an inexperienced user can adjust easily and intuitively.

It is also an objective of the present invention to provide a positioning device that can be easily assembled or repaired on the field by unskilled workers.

It is another objective of the present invention is to provide a positioning device that is inexpensive to manufacture, easy to install and is operational over a substantial range of manufacturing tolerances.

It is yet a further objective of the present invention is to provide a means for regulating the movement of telescoping members to substantially eliminate jerking or abrupt accelerations.

Various other objectives and advantages of the present invention will become apparent to those skilled in the art as a more detailed description is set forth below.

SUMMARY OF THE INVENTION

The aforesaid and other objectives are realized by providing a positioning device for ease in adjustability and positioning, for use in furniture. In the preferred embodiment of the invention, the user has only to provide an external force upon the strut of the positioning device to cause the strut to easily and precisely telescope within a mounting member. The positioning device is also provided with means for limiting the displacement of the strut relative to the mounting member so the strut can only telescope or slide for a limited distance while remaining at all times in sliding but controlled engagement withing the mounting member.

The mounting member may be provided with guide means that include deformable elements held captive within channels thereof for sliding engagement with the strut. Additionally, the mounting member may be made as an integral feature of the seat pan of a chair instead of an add-on thereto.

The positioning device regulates the speed of movement by a deformable member inserted so as to contact both the strut and mounting member simultaneously to provide friction during motion. As a result, the force required to telescope the

members can be made to remain substantially constant along the entire movement, thus minimizing abrupt accelerations of the strut. Alternately the positioning device may be provided with a deformable member for selective engagement in a variety of discrete positions.

BRIEF DESCRIPTION OF THE DRAWINGS

Fig. 1 shows a three-dimensional representation of a typical ergonomic chair that includes laterally adjustable arms with pads as utilizing the invention herein;

Fig. 2 demonstrates an enlarged three-dimensional view of the positioning device in its preferred form configured as a chair arm, without the arm pad;

Fig. 3 depicts an exploded view of the positioning device of Fig. 2;

Fig. 4 features a front view of the mounting member 14 as seen along lines 4-4 of Fig. 3;

Fig. 5 pictures a top view of the positioning device as seen in Fig. 2 at an innermost position of engagement;

Fig. 6 illustrates a cross sectional view of the positioning device at a position of engagement corresponding to that shown in Fig. 5, along lines 6-6;

Fig. 7 shows a top view of the positioning device of Fig. 2 at an outermost position of engagement;

Fig. 8 depicts a front view of a guide element within a channel of the mounting member as used in prior art;

Fig. 9 demonstrates a front view showing a guide element within an elliptical channel of the mounting member of the present invention;

Fig. 10 illustrates a three-dimensional view of the mounting member configured as a chair seat;

Fig. 11 shows a cross-sectional view of the chair seat of Fig. 10 seen along lines 11-11 thereof;

Fig. 12 demonstrates a three-dimensional view of a first alternate embodiment of the positioning device;

Fig. 13 features a partial cross-sectional view of the positioning device of Fig. 12 as seen along lines 13-13 of Fig. 12;

Fig. 14 pictures a top view of a second alternate embodiment of the positioning device of the invention;

Fig. 15 illustrates a top view of the positioning device of Fig. 14 at an intermediate position of adjustment;

Fig. 16 depicts a cross-sectional view of the positioning device of Fig. 14 as seen along lines 16-16 thereof;

Fig. 17 features a cross-sectional view of the positioning deice of Fig. 15 as shown along lines 17-17 thereof;

Fig. 18 pictures an exploded view of a prior art positioning device;

Fig. 19 shows a front view of part of the positioning device seen in Fig. 18; and

Fig. 20 depicts a cross-sectional view of the positioning device as seen in Fig. 18 but in assembled form.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT AND OPERATION OF THE INVENTION

For a better understanding of the invention and its operation, turning now to the drawings, Fig. 1 shows standard chair 2 having preferred positioning device 1 installed thereon. Chair 2 comprises arms 3 and 4, seat 5, back 6, base 7 and arm pads 8 and 9. Shown enlarged in Fig. 2, positioning device 1 comprises mounting member 14 having mounting slots 10, flanges 10A, slot 13 having ends 11 and 12, and cavity 16 for slidably receiving strut 15. Mounting member 14 also includes channels 21'-24' for receiving deformable tubular guide members 17-20 shown in Fig. 3. Two positioning devices 1 are assembled as

shown in Fig. 2, one for each of chair arms 3 and 4. Arms 3 and 4 are then mounted to the underside of chair seat 5 by means of mounting slots 10 in mounting flanges 10A with screws (not seen). Positioning devices 1 allow a chair occupant (not shown) to easily, manually horizontally position arms 3 and 4 relative to chair seat 5 in any of an infinite number of positions illustrated as P1, P2, P3, P4 and P5, etc., without tools, while seated. Slot ends 11 and 12 of slot 13 in Fig. 2 define the range of motion.

In Figs. 3, 4 and 6, preferred positioning device 1 comprises mounting member 14, preferably formed as a metal extrusion rigidly affixed to chair seat 5 (not seen in Figs. 3-6), and L-shaped strut 15. Strut 15 is slidably inserted into cavity 16 of mounting member 14 so that it is substantially free to telescope or slide therewithin. Deformable guide members 17, 18, 19 and 20 are longitudinally inserted into channels 21', 22', 23' and 24' respectively and are retained by retaining means 25 integrally formed with mounting member 14 and positioned at the ends of channels 21'-24'. Deformable polymeric guide members 17-20, shown in Fig. 6 allow for smooth displacement of strut 15 relative to mounting member 14.

Shown in Fig. 3, resilient member 26 is inserted within cavity 27 of strut 15 to slide while contacting surface 28 (Fig. 4) and deformable guide member 20. Polymeric resilient member 26 provides speed control and a smooth, even movement by

producing friction with guide member 20 during displacement of strut 15.

A détente means allows for limited displacement of strut 15 within mounting member 14 and includes stud 29. Stud 29 is threadably affixed within hole 30 of strut 15. Stud 29 is made of such length that it protrudes through strut 15 and hole 30 to slidably engage slot 13 in mounting member 14. Displacement of strut 15 is limited by stud 29 reaching ends 11 and 12 of slot 13, responsive to forces 34 or 35 (Figs. 3, 5 and 7) as manually applied to strut 15.

As shown in Figs. 5 and 7, positioning device 1 is shown fully displaced responsive to force 34 so that stud 29 has contacted end 11 of slot 13 in mounting member 14 and further displacement of strut 15 is only possible responsive to opposite force 35. Strut 15 can be caused to move responsive to force 35 opposite force 34 and be selectively displaced to any of an infinite number of lateral positions as illustrated in Fig. 1.

Fig. 8 depicts a prior art mounting member and shows guide member 19 within channel 23 of mounting member 14. When strut 15 is inserted within mounting member 14 it is tangent to tubular guide member 19 and produces load 38 that acts on and causes pressure 39 (illustrated by arrows 39) around the periphery of guide member 19. Guide member 19 cannot deform in channel 23 to an appreciable degree due to its close fit

therewithin and strut 15 thus remains distant from mounting member 14 as seen by space 31.

In Fig. 9 a new preferred channel shape is seen in channels 21', 22', 23' and 24' (only channel 23' is shown) each designed having an elliptical shape so as to provide peripheral cavities 36 and 37 to allow for easy deformation of guide member 19 when submitted to load 38. The somewhat deformed state 40 of guide member 19 seen in dotted lines allows guide member 19 to partially occupy peripheral cavities 36 and 37 of channel 23' so strut 15 is therefore able to displace from an initial position 41 (shown as dotted lines) to a new position 42. As would be understood channels 21', 22' and 24' are identical in shape to channel 23'. Thus the channel embodiment of Fig. 9 is more tolerant when strut 15 is undersized or oversized and reduces binding or looseness of strut 15 relative to mounting member 14 over a wider range of manufacturing conditions and tolerance.

In an alternate embodiment of the invention, positioning device 1A is shown in Figs. 10 and 11 with the mounting member integrally molded within chair seat 5 which is operational as earlier described. Chair seat 5 is preferably molded to include cavity 16, channels 21, 22, 23 and 24 (or preferred channels 21', 22', 23' and 24') to receive guide members 17-20 and slot 32. Strut 15 is inserted into cavity 16 and is retained in sliding engagement within cavity 16. Stud 29 is slidably engaged within slot 32 and affixed to strut 15 for limiting the displacement of strut 15 relative to cavity 16.

In Fig. 12, the invention is seen in a further alternate embodiment positioning device 1B comprises mounting member 14' provided with mounting channels 46 and 47 extending along the entire length of mounting member 14' in order to provide clearance for mounting screw heads (not seen). Holes 48 are provided centrally located near both ends of mounting channels 46 and 47 for inserting mounting screws (not shown). In this manner, mounting member 14' can be made so that mounting flanges 10A as seen in Fig. 2 are functionally replaced by mounting channels 46 and 47.

As seen in Fig. 13, a partial cross-sectional view of positioning device 1B shown in Fig. 12 is provided with securing means 49 integrally formed on both ends of guide members 17-20. Once in place securing means 49 are abutted against ends 14A and 14B of mounting member 14'. Forming of the securing means 49 is best accomplished by heat forming the ends of guide members 17-20. It is to be understood that securing means 49 can also be implemented on guides 17-20 as shown in Figs. 2-11.

In another alternate embodiment shown in Figs. 14-17, positioning device 1C comprises mounting member 14C and includes slot 13C comprising a series of notches 55-59 and teeth 51-54 on one side for selective engagement with flexible stud 50 attached in hole 60 of strut 15C. Stud 29C is slidably engaged within slot 13C and affixed to strut 15C for limiting the displacement of strut 15C relative to mounting member 14C between slot ends 11C and 12C.

During operation strut 15C is manually displaced responsive to force 34 sufficient to cause deformation of flexible stud 50 as it is alternately moved from a position of engagement concentric with notches 55-59 to a position tangent to teeth 51-54 of slot 13C. Flexible stud 50 is preferably made of a polymeric material and may contain cavity 50A to allow for additional deformation.

In Fig. 16, positioning device 1C is shown in cross-sectional view of Fig. 14 at a position demonstrating the concentric engagement of plastic stud 50 with notch 55 of slot 13C. In Fig. 17, positioning device 1C is shown in a cross-sectional view of Fig. 15 and has been displaced responsive to force 34 to a position where flexible stud 50 is tangent to tooth 51 and causes flexible stud 50 to deform responsive to interference therebetween. It is to be understood that the selective displacement of strut 15C can be equally performed in the direction of force 34 or force 35. Figs. 18-20 depict positioning devices of prior art.

While only one chair arm positioning device is discussed and illustrated herein, a typical employment of the invention would require use on both chair arms 3 and 4.

It is also to be understood that the use of the device is not limited to chair arms, it being also suitable to provide adjustable means for telescoping members intended for other purposes. It will be apparent that many useful modifications of

the device are possible, without departing from the fundamental basis of the invention.

The illustrations and examples provided herein are for explanatory purposes and are not intended to limit the scope of the appended claims.